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# BLACK HILLS BEETLE CONTROL

## DIXIE-BRYCE PROJECT 1956

## TECHNICAL GUIDELINES FOR DIXIE NATIONAL FOREST

By

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The Dixie National Forest and Bryce Canyon National Park are currently battling an epidemic of Black Hills beetle, Dendrootonus ponderosae Hopk. A control program was started in 1951 and has been in progress annually on various areas of the National Forest and National Park. Again in 1956, it will be necessary to carry on this effort to reduce the beetle population. The purpose of this report is to list and review the entomological considerations in connection with the conduction of the 1956 project.

## PROGRAM

From the standpoint of entomological justification, the control effort should be directed towards the infested areas on the East Fork Division, Johns Valley, and Pine Creek of the Escalante Division. The treatment of the infested trees should be accomplished by the application of an ethylene dibromide water and oil emulsion. Wherever possible, salvage logging should supplement the chemical treatment of infested trees within the control boundaries. Infested trees in other areas should also be removed by logging if at all possible.

## METHODS AND PROCEDURES

Treatment of the infested trees can start any time after the area opens up. However, starting while the weather is still cold will cause some difficulties in the mixing of the insecticidal components, i.e. the ethylene dibromide will have to be heated to disolve crystals that form whenever the temperature of EDB drops below 48° F. (the lower the temperature the harder to disolve the crystals). As has been the case in the past, treatment can be continued until beetle flight about the middle of July but effort should be made to finish by June 30. It is becoming evident that the July treating is less effective since in many cases the beetles are far enough along that

they actually emerge after the spray is applied, but before the insecticide can reach them in sufficient quantities to cause mortality.

The units on the East Fork of the Sevier, Pine Creek, and the Pine Lake unit should be string lined and treated by combination spotting, treating crews. The string lines should be run in the same manner as in the past, that is, across contour and approximately 5 chains apart. The three-man mounted spotting-treating crew seems to be an efficient and effective size. However, the size of the treating crews can vary to meet the need. In all probability at least most of the patches of timber on the Mud Lake-Birch Creek unit can be covered satisfactorily without laying strings. It would seem that it would be more efficient to make separate operations of spotting and treating in this unit. The spotting Crew for the Mud Lake-Birch Creek Unit should contain 4 men or more. The treating crew should be made up of 3 men which may need to be occasionally supplemented by a "long packer." The treating should follow the standard followed in the past, that is, all trees should be sprayed standing. Trees too tall to allow spraying the full height of the infestation should be felled after spraying as far as possible and the unsprayed portion of the top treated. In general, the practices and organization developed and used the other years of the project should act as a pattern for this year's project. One additional man to act as an over-all trainer-checker should be included in the organization. This man would be responsible directly to the project supervisor. His duties should include over-all inspection to determine if acceptable methods are being used, to train additional crews or crewmen as they are hired, and to work with and supplement the foreman on checking to see that the areas are properly covered and that the trees receive sufficient insecticide, etc. This man could also run the string lines that separate units and mark control boundaries. He would, of course, receive considerable help and training from representatives of the Division of Forest Insect Research. The Division of Forest Insect Research will again be responsible for: (1) the training of personnel in the technical phases, (2) correctness of insecticidal formulations and mixing, (3) guidance on techniques, and methods, (4) collection and analyses of biological information that could influence the conduction or life of the project, (5) determination of the effectiveness of the project from an entomological viewpoint.

## EQUIPMENT AND SUPPLIES

To make the 72,000 gallons of finished emulsion required to treat approximately 6,000 trees when applied at the rate of 12 gallons per tree will require:

Ethylene dibromide, Tech. grade, 99% - 43,200 lbs.

Emulsifiers:
Triton X100 or equal, 3,600 lbs.
Triton B1956 or equal, 3,600 lbs.

Fuel oil No. 1 or No. 2 - 14,400 gallons.

An efficient project requires an adequate supply of working equipment and supplies. It does not seem desirable to list the equipment and supplies needed as the Dixie National Forest has had considerable experience in this matter. However, it is suggested that the "Tomahawk" brand hand axe is more suitable for bark beetle inspection than the hand axes used in the past. Every crew member should be equipped with a hand axe. Spray nozzles and nozzle fans are easily damaged, therefore, it would be advisable to have a supply of No. 6 solid stream nozzles and Colorado type nozzle fans equal to at least twice the maximum number of pumps that will be in action.

## II Mixing and Application of Insecticide

The standard 380 mixture should be used. The formula is as follows:

| | |
|---|---|
| Stock solution (EDB emulsifiable concentrate) | |
| EDB (ethylene dibromide) tech. grade | 3. lbs. |
| Emulsifier | |
| Triton X100 | .25 " |
| Triton B1956 | .25 " |
| Fuel oil to make | 1 gal. |

To make finished emulsion disperse 1 volume of stock solution into 4 volumes of water.

A workable formula for field use is:

| | | |
|---|---|---|
| EDB (90 lbs.) | 1 Jeep can | (5 gals.) |
| Triton X100 (7.5 lbs.) | about | 1 gal. |
| Triton B1956 (7.5 lbs.) | about | 1 gal. |
| (a suitable volume measure can be made from a one-gallon oil measure). | | |
| Fuel oil | | 23 gals. |

It is suggested that the mixing be done in 50 gallon drums that have had the bottoms removed. A suitable elbow of pipe and spigot should be threaded into the 3/4" spigot opening. The drums should be placed open side up on planks to protect the spigot. A mark is made on the inside of the drum at the 30-gallon level.

To mix field formula concentrate add roughly 1/2 of the fuel oil, pour in EDB and emulsifiers, fill to 30 gal. level with fuel oil. Stir the solution with a shovel and drain off in 1 gallon lots. Pour 1 gallon of the concentrate into each Jeep can. The 4 gallons of water should be added to each Jeep can shortly before the spray is to be applied. The mixture should be shaken to insure the formation of a good emulsion. The resultant emulsion should have a rich milky white creamy appearance. Finished emulsion should be used within a 48-hour period after addition of the water.

The finished emulsion should be applied to the infested boles in sufficient quantities to cause the emulsion to run. Care should be exercised to make certain that the under sides and hard to get at places of the down trees are thoroughly wetted.

# Hazards Involved in The Use of Ethylene Dibromide

Ethylene dibromide in the concentrated form is extremely harmful to warm blooded animals. Men can be seriously affected by inhalation of the vapors, and their bodily contact with the liquid. Reasonable care will avoid these dangers.

In order to reduce the hazards to a minimum, a carefully chosen man, and trained assistants if necessary, who fully understands the hazards should be selected to mix or otherwise handle the EDB concentrate.

No one else should be allowed to come in contact with the tech. grade EDB or with the stock concentrate.

All mixing should be done outside.

A supply of rags and clean water should be on hand at mixing stations at all times.

No protective clothes are required.

Mixer must wash off spillage with clean water.

Any clothing that becomes contaminated should be removed and washed or aired.

Properly handled EDB is not dangerous but improperly handled it produces serious burns, sickness and even death.

The finished EDB emulsion as applied to the trees is relatively harmless. However, if confined for extended periods in the clothing it will cause some burning and irritation. To protect the treater:

A supply of clean rags and water should be carried by each crew.

Treaters should be instructed to avoid repeated exposure to spray drift and leakage.

All emulsions that reach the skin should be washed off immediately.

Treaters should have their clothing washed at least once a week--if an unusual amount is spilled on the clothing they should be removed immediately and washed.

IN GENERAL, WHENEVER HANDLING TOXIC CHEMICALS, IT IS GOOD BUSINESS TO BE OVERLY CAUTIOUS RATHER THAN TAKE A CHANGE.

# HAZARD TO MEN ENGAGED IN SPRAYING SPRUCE TREES WITH AN ETHYLENE DIBROMIDE EMULSION

## CONCLUSIONS

1. The concentrations of Ethylene Dibromide found in the air were below 25 ppm. which is probably a satisfactory control figure for repeated eight-hour exposures.

2. Results of animal experiments indicate that vapor concentrations of a few hundred ppm of Ethylene Dibromide can cause systemic effects on single short exposures. If single exposures for less than 7 hours are kept below 100 ppm. no significant exposire is likely to result.

3. Skin contacts of more than a very few minutes duration with the emulsifiable concentrate are expected to result in local burns. Systemic effects may also occur if such contacts are at all extensive and prolonged.

4. If the 380 emulsion is held in contact with the skin, significant irritation (possible burns) are to be expected. There is also a possibility of significant skin absorption from continued contact with clothing which has become soaked with spray.

5. If all other skin surfaces are protected, there is little likelihood of skin irritation or absorption due to occasional exposure of the face to spray drift.

## DISCUSSION

Air samples were taken while applying the 280 mixture (2 lb. EDB/5 gal.) 380 mixture (3 lb. EDB/5 gal.) and an oil solution containing 1-1/2 lb. EDB/5 gal. There seems to be no noticeable difference in exposure of operators while handling the various mixtures. There was no significant variation between results obtained by using an obsorber and those obtained by means of an impinger. This indicates that the inhalation hazard is likely to be due to vapor rather than small drops. These samples were taken during quite cold weather and it is likely that somewhat greater values would be obtained at higher temperatures. The concentrations shown in the table may be compared with 25 ppm which is thought to be a satisfactory control figure for repeated eight-hour exposures. It should be remembered that exposure to a few hundred ppm of Ethylene Dibromide for single exposures of one hour or more are likely to result in adverse effects. No significant exposure is likely if single exposures are kept below 100 ppm.

A sample of the concentrate, when applied to the skin of rabbits resulted in burns and death of the animals within 24 hours. The 380 mixture, when bandaged onto the rabbit's skin, caused severe irritation.

The same mixture, when applied to the uncovered ear, was slightly irritating. These results would indicate that the emulsifiable concentrate must be kept off the skin by the use of suitable protective equipment. In the event of accidental contact, the concentrate must be washed off immediately. Ordinary clothing, which covers the skin except for the face, is evidently adequate protection during the spraying operation, provided the clothing is not allowed to wet through. Oil soaked clothing should, of course, not be worn. It appeared that gloves and caps are most likely to become soaked during the spraying operation.

CONCENTRATIONS OF ETHYLENE DIBROMIDE FOUND IN AIR WHILE SPRAYING TREES WITH ETHYLENE DIBROMIDE MIXTURE

| Sample | Description | Concentration parts per million |
|---|---|---|
| 929 and 127 | General atmosphere immediately following spraying. Trees in the area being sprayed nearby. Some odor of EDB and oil deteotable | 3.5; 8.2 |
| 143 and 214 | Same area as No. 929 sample taken 24 hours later and after a heavy rain. No odor | 2.9; nil. |
| 103 | Breathing zone of operator while spraying 280 mixture | 17 |
| 171; 63 54; 149; 53; 57 | Breathing zone while spraying with 380 mixture | 8.2; 14; 11.4; 15; 9.5; 7.1 |
| 58 50 | Breathing zone while applying oil solution | 5.5; 7.9 |

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